SCIENCE.

FRIDAY, FEBRUARY 27, 1885.

COMMENT AND CRITICISM.

THE MAP and geographical article by Lieut. Greely, which appear in this issue, may fairly be said to contain the most important additions to the geography of the polar regions which have been made in some years. The importance of the discoveries of the Greely party lies not merely in their extending the area of mapped coast, but also in the distinctive, and to some extent unexpected, character of the physical features of the region now first pointed out. The continuation of North Greenland in the direction and manner determined by Lockwood and Brainard was not unforeseen, or at least is what might have been reasonably predicted. The information as to the narrowness of Grinnell Land and the trend of its western shores is hardly what any one would have anticipated; and the discovery adds piquancy to the ordinary interest of new exploration. In this connection, the information reported by Dr. Boas is of peculiar interest. It will be singular, indeed, if it finally appears that the channel of Smith Sound, and its continuations, are projected like a 'covered way' into the realm of ice, as if for the especial benefit of explorers. The absence of any considerable body of land north-west from Grinnell Land must have an important bearing on the question of the ocean-currents of the arctic region. We commend the map to the consideration of a well-known geographical amateur, who, if telegraphic despatches are to be trusted, immediately after the receipt of the first 'cablegram' of Greely's explorations, made haste to assure the British public that there was no reason to suppose that Greely's party had been farther north-east than Beaumont Island, and that their own supposition that they had made progress was doubtless an entire misconception! The adverse critics of arctic work should bear in mind that the entire geographical and scientific work was accomplished without disease, disaster, or even serious frost-bite.

A RECENT extension of the work undertaken by the secondary meteorological services of our country is the establishment of local signals, indicating the coming changes of weather as telegraphed from the signal-office in Washington. This has been attempted by four of the local services. Ohio led the way a year or more ago by arranging with several railroad-lines for the display of colored signals on the sides of the baggage-cars, and this system has been extended into Canada and Pennsylvania. Louisiana had at last accounts sixty-seven stations at which flags were hoisted to forewarn the planters of probable frosts. Alabama has a system of three flags in nine combinations, in operation at about thirty stations. The system is approved, and is extending month by month. Several towns in New England are adopting the Ohio system, introduced here through the New-England meteorological society. Besides all these, there is a considerable number of volunteer-stations at which the 'cold-wave' flag is displayed.

The latest suggestion for local signals comes from Vermont, where it is proposed to spread the indications by factory-whistles. The point is made that the out-of-town farmers, who have especial need of the weather warnings, have the smallest opportunity of learning them soon enough, either from newspapers, post-office bulletins, or local flags. Blasts from powerful steam-whistles could, on the other hand, be heard five or more miles around; and they would carry the news to nearly every part of a manufacturing state. All the Vermont boards of town selectmen are to be petitioned to consider the matter, and we shall be glad later in the season to announce good progress in the work.

What is a microscopist? First and last, an amateur who rejoices in the beautiful variety of microscopical specimens; one who treasures slides in the exact centre of which is a ring of cement neatly put on, and holding a cover-glass under which lies some fine test-object, — a delicate diatom, a podura scale, a bit of tissue the vessels of which are injected with gorgeous red, a polarizing crystal: in short, almost any tiny scrap of the universe, if so it be pretty in the pattern of its shape and color. These same treasured slides must have neatly bordered labels, and be catalogued and stored by a special system. The microscopist is one who has a formidable and extensive deal of brass stand, which can hold together a cabinet of appliances; and he will display the most admirable patience in getting them in position, until at last he sees the specimen, and is ready to clean and pack away his apparatus. His series of objectives is his glory; and he possesses a fifteenth of Smith and Brown, which will resolve a band of Nobert's not to be resolved by the objectives of any of his friends. His instrument is his pet: about it his interest centres, while the direction of his studies is determined, not by any natural bond between the objects, but by the common quality of minuteness. Is it not curious? Imagine any one deliberately setting out to study whatever he could cut with a knife. We should pity the man who chopped up the sciences according to the instrument he used. We cannot be brought to regard anatomy as a department of cutlery, nor can we seriously admit histology as a department of microscopy.

Scientific men have been very lenient towards the microscopists; and yet the latter, who have long been allowed to march as hangers-on to the regular scientific army, have gradually lagged behind. The army has grown, and divided into many separate corps, traversing the country of the unknown in all directions, and the microscopist knows not whither to follow. If he turns in any direction, he must join with the special work there, and can glean only in one field: he is no longer the universal gatherer. One must be of the army to be with it, and the forces are too scattered for any hanger-on to flit from one division to another. The would-be microscopist has no place among scientific investigators. He must enlist in one company and there remain, or else be content to rank as an amateur, and not as a scientific man.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

The north magnetic pole.

With my article in *Science*, No. 98 (Dec. 19, 1884), entitled 'The Netschilluk Innuit,' there appeared a map of the distribution of those Eskimo, in which I placed the north magnetic pole in about longitude 99° 35′ west from Greenwich, or about sixty-five miles due west of the position given by Ross, its discoverer, in his sledge-journey of 1831. Since this map was issued I have received two letters from well-known scientific gentlemen, and a personal inquiry from another, asking why I so mapped this change in the magnetic pole, and on what observations or conclusions it was based, even though I had put an interrogation-point after the words indicating the position. It is well known that many calculations have been made respecting the western movement of this pole since its discovery; and, varying as they do, they all, so far as I have seen, would place it much farther to the west, for the year 1879, than my location gives it.

The above inquiries and facts make me think it would be interesting to give in your publication the rude and approximate manner in which I located it as above, leaving each one to judge of its value. Its latitude I assumed to be the same as that determined by Ross, as all writers speaking of its revolution, whatever be its rate, give the geographical pole as its centre. Its latitude, therefore, would not vary. I consider this co-ordinate, determined in this manner, by far the most unreliable of the two; I believe, however, that those interested in the subject will consider it also the least important, as being the least likely to vary considerably. My only instrument for determining the position of the pole was an ordinary compass, but an extremely delicate and reliable one in its proper sphere, and returning to the same point, in the temperate zones, to within less than a degree of arc started from any position that could be given. When at Cape Felix, the most northern point of King William's Land, the needle remained sluggishly in almost any position that was given it; when pointed in a north-east or south-west direction, I thought I detected a slight tendency to move to the westward. At Franklin Point I made some seventy-five to one hundred observations (the exact number I have in my journals, packed in Portland, Ore.; but I think my memory will be close enough for descriptive purposes, and probably more exact than the rough approximations), and the horizontal needle now commenced to show a little activity; a mean of the observations showing about longitude 99°, where its direction cut the Ross latitude of the magnetic pole. Near Point Little, I took the longest and most careful series of observations, and the needle always returned to within 18° (this I distinctly remember) of the pole as I have located it in the Netschilluk map, and this

return was made from every quarter-point of the compass several times (my records show this more accurately). My other observations of similar character were at camp on Terror Bay, and at Reindeer Camp on Simpson's Straits. All of these points are somewhere between 99° and 100° west longitude; and I firmly believe the observations sufficiently accurate to say, in no rough way, that in 1879 the north magnetic pole was between these two meridians, with its latitude quite undetermined.

In the fall of 1880 I published a small note about this interesting point, in which the above appeared, and also a few calculations regarding the westward rate of progress, which I cannot give from memory. I think that the thermometric observations close to this district, straggling and interrupted though they were, go far to prove that the magnetic pole, and pole of minimum depression, are identical, or nearly so.

FRED'K SCHWATKA.

New-York City, Feb. 9.

Total eclipse of the sun in August, 1886.

In the year 1886, Aug. 28–29, will occur an eclipse of the sun, whose maximum duration of totality is over six minutes of time. Opportunities like these for the study of solar physics are sufficiently rare for astronomers to be always eager to improve them whenever it is deemed practicable. Although the circumstances of this eclipse are found upon examination to be beset with peculiar difficulties, still it may not be amiss to make a statement of them, that the possibilities of its observation may be clearly understood.

In this eclipse the axis of the moon's shadow, soon after touching the earth, passes very near or through the following islands, — Los Roques, Orchilla, Blanquilla, Grenada, and Cariaçoa, — which are some of the Windward Islands which skirt the northern coast of South America. From this point the shadow sweeps across the broad Atlantic, and touches no land until it reaches the African coast at Benguela, which place lies almost exactly on the central line.

By examination of the chart of this eclipse, published by the 'American ephemeris,' it will be seen that the totality will occur only about half an hour after sunrise at the most favorable station in the West Indies, with a duration of totality of about three and a half minutes. On the African coast the duration of totality is about four and a half minutes, and the altitude of the sun is amply sufficient for favorable observation.

Benguela is about four hundred miles south of the mouth of the Kongo, and about two hundred miles south of the mouth of the Koanza. The climate of the lowlands bordering the coast near Benguela is fatally unhealthy for strangers, making it compulsory, on the score of prudence, for an observing party to penetrate the interior sufficiently to attain the mountainous highlands which lie not far inland.

The American board of commissioners for foreign missions has for some three years occupied two mission-stations in this region; viz., Bailundu, about a hundred and thirty miles eastward from Benguela, and Bihe, about seventy miles south-east from Bailundu. Through the courtesy of Rev. Judson Smith, D.D., secretary of the American board, and Mr. Frederick A. Walter, secretary of this west-central African mission, I have received definite statements of some of the precautions necessary, and some of the difficulties to be encountered by an observing party locating in this region. I will give in brief the points with which Mr. Walter favors us.

Dangers to the person from savages are not to be apprehended. The climate of Bailundu and vicinity is exceedingly salubrious. During a residence of nearly three years, Mr. Walter and his family have experienced no illness to be ascribed directly to the climate, but in every case to overwork, over-exposure to the sun, or want of proper food.

The difficulties in reference to transportation are considerable. Transportation is done entirely by men: wagons and animals cannot be used. The gross weight for a carrier is from sixty-five to seventy pounds: commonly it does not exceed fifty-eight pounds. Packages, either bales or boxes, should be of about the following dimensions: fourteen inches by nine inches by thirty inches, or, if more convenient, sixteen inches by ten inches by twenty-four inches. No single package should exceed eighteen inches in width by ten inches in depth. Pieces not exceeding sixty pounds in weight, though eight or ten feet long, can be carried by a single carrier.

As to means of subsistence, an observing party must bring *all their supplies with them*, as it is essential to the health of new-comers that they should live on food to which they are accustomed. The time required for a round trip of a caravan from Bailundu to Benguela may be stated as one month to six weeks.

Mr. Walter states that the chances for clear sky at the time of the eclipse are very favorable.

It may be stated that the land rises very abruptly as one leaves the coast from Benguela, and in a few miles attains a very considerable altitude, and throughout these highlands the climate is very healthful.

A. N. SKINNER.

A simple calendar reform.

Reform in the standard of daily time having now been happily accomplished, to the great convenience of the public, another simple reform in the monthly calendar remains desirable, which would greatly simplify commercial calculations, and computations depending on the calendar. In our present calendar the disturbing elements which cause inconvenience are connected with the month of February, which at once is shorter than the average month, and also disturbs the revolution of the Dominical letters by the addition of the intercalary day in the leap-years. From this method of inserting the intercalary day in the midst of the year, arises the necessity of having two Dominical letters in the leap-years, and of distinguishing the two unequal parts of such years in all calendar computations.

Now, it is evident, that, if the intercalary day were inserted at the end of the year, the revolution of the Dominical letters would go on undisturbed, and we should never have more than one in any year. But as December already has thirty-one days, to obviate the inequality of months, one day should be taken from it, and one from some other month of thirty-one days, say July, and both be added to February. Thus an equality would be established, as nearly as possible, by an alternation of months of thirty and thirty-one days each, with the least possible alteration of the existing calendar. In each half-year, any two successive months (with the exception of November and December in ordinary years) would have sixty-one days, and each quarter not less than ninety-one, nor more than ninety-two days.

As it is now, the first two months have usually only fifty-nine days, while July and August have sixty-two; the first quarter has ordinarily only ninety days, while the third and fourth quarters have each ninety-two days. The new arrangement would establish a simplicity and symmetry in the calendar, which

would prove a great convenience to the business and scientific public, and equalize the time value of the calendar months and quarters.

A very suitable opportunity to introduce the improved calendar would be on the first recurrence of the leap-year, in 1888. In the mean time the proposed change could be fully discussed and ventilated.

The following table will show the relations of the old and the new calendar to each other:—

DAY OF YEAR.

Old calendar.			New calendar.		
Jan. 31		31	31	Jan. 31	
Feb. 28-9		59-60			
			61	Feb. 30*	
March 31		90- 1	92	March 31	
	90-1				92
April 30		120- 1			
			122	April 30	
May 31		151- 2	153	May 31	
June 30		181- 2	183	June 30	
	91				91
July 31		212- 3			
			213	July 30*	
Aug. 31		243- 4	244	Aug. 31	
Sept. 30		273- 4	274	Sept. 30	
	92				91
Oct. 31		304- 5			
			305	Oct. 31	
Nov. 30		334- 5	335	Nov. 30	
Dec. 31		365- 6	365-6	Dec. 30-1	
	92				91-2

* In transferring from old calendar to new, from March to July inclusive, deduct *two* days; from August to December, deduct *one* day. Thus March 1 (old calendar) will be Feb. 29 (new calendar); but Aug. 1 (old calendar) will be July 30 (new calendar).

The following adaptation of the old lines may serve to assist the memory:—

30 days, *July*, September,
April, June, and November,
February and *December*;
The last, in leap-year, 31,
And always the remaining five.

EDWARD P. GRAY.

Ingersoll's 'Country cousins.'

Absence from home has delayed until to-day my seeing the extended (and therefore highly complimentary) notice of my "Country cousins: short studies in the natural history of the United States," to which you were good enough to give space in your issue of Feb. 6.

Acknowledging its kindly tone throughout, I wish to retort with equal courtesy (if possible) upon your writer at the point where he seems to find most fault; namely, my assertion that the flukes of the whale and other cetaceans represent the hinder flippers of the seal and the hinder legs of terrestrial quadrupeds. That anybody should deny this, surprised me. The language in which I expressed the statement was less precise than that demanded by a technical treatise, as 'Country cousins' makes no claim to be; but only a captious construction could make out that I meant more by what I said than that in a general way the flukes of the Cetacea were representative (in a greatly altered condition, of course) of the hinder flippers of a seal, and structurally were quite as distinct as they, from the forked tail of a fish.

Leaving my assertion and possible evidence out of the question, I should like to know what the comparative anatomists of the country have to say as to this point between my critic and myself. Do not Dr. Elliott Coues and Dr. Theodore Gill teach that a whale's fluke is directly homologous with the integumentary portion of the hinder limbs of the rest of the Mammalia? Of course, every one knows there are no *bones* there. Has not Professor John Ryder discovered, since my pages were in type, that the nerves which supply the flukes are not those which pass along the spine into the tail (where it exists), but, on the contrary, are homologues of those in the higher mammals, which, branching from the spinal cord in the lumbo-sacral region, supply the hinder limbs? What has embryology to show as to the genesis of the flukes? Do they arise structurally as the forks of a tail, or as limb-appendages? It is just possible that the inaccuracy and carelessness with which I have been rather freely accused have been over-estimated.

ERNEST INGERSOLL.

New Haven.

[In respect to the criticism of 'Country cousins,' to which the author of the work so warmly but courteously objects, it may be sufficient reply to quote the statement criticised by the reviewer, which is as follows: "If I had the time, I could prove to you that the difference between the fin of a fish and the boneleg of an otter or of a dog, or of our own arm, is not so very great; and it would be easy to show how nearly alike the flipper of the seal and fore-leg of a land mammal really are. . . . The same comparison will hold good for the hind-feet of the otter and the hind-flippers or 'tail' (which is *not* a tail) of the seal; and it is equally true of the walrus, *and of the whale, porpoise, grampus, black-fish, and other cetaceans.*" Not a word is said about the 'flukes' of a whale, nor is any reference made to the 'forked tail of a fish,' in the passage criticised. We again submit that this is 'evidence of either ignorance or carelessness' on the part of the author. It is at least a grossly slipshod use of language. — REVIEWER.]

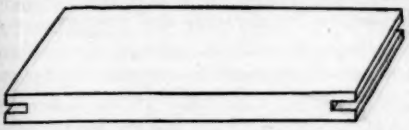
A new method of arranging entomological collections.

A very large proportion of the time of a faithful curator of a growing entomological cabinet is devoted to the re-arrangement of his collections, — to simply pulling pins from one place in a cork-lined box, and putting them into another. In large and well-endowed museums this labor can be lessened somewhat by leaving spaces in the boxes for additions; but in an ordinary entomological cabinet this is obviously impracticable, and, even where this plan is adopted, it affords only partial relief. The advance of knowledge is constantly changing our ideas as to the sequence of species; and from time to time the appearance of a monograph necessitates the re-arrangement of our collections, if we would have them represent the present state of science.

But so great is this labor of re-arrangement, that only few if any of the larger collections are kept in any thing like perfect order. And the faithful curator is forced to give to mere manual labor, time which otherwise would be devoted to original research.

About two years ago I devised and put into use a mode of arranging collections which reduces to a minimum the labor of re-arrangement. This system is an application to entomological cabinets of the principle which underlies the slip system of keeping notes. Its fundamental idea is to fasten in each

case all the specimens illustrating a single species upon a separate block. A standard size of block is adopted for what may be termed the 'unit block.' The size of this block will depend on the size of the drawers in the cabinet. Other blocks which are multiples of this size are also used. The blocks are made of soft non-resinous wood, basswood, or cucumber-tree. They are cut from well-seasoned boards three-eighths of an inch in thickness. I do not find it necessary to fasten the larger blocks in place in any way, beyond keeping the full number of blocks in each box. In each end of each block there is a groove (see figure). Small hard-wood strips are



made to fit into these grooves. In case of the larger blocks, these strips tend to prevent warping. The narrower blocks, such as would be used to mount a single row of small beetles, are fastened together by means of these strips into groups of three or four. Each of these groups are as stable as a single large block. When the blocks are in place in a drawer, the strips are entirely concealed. As the blocks can be cut with a circular saw, and the grooves and strips made in the same way, they are not necessarily expensive.

J. HENRY COMSTOCK.

TOO MANY NAUTICAL ALMANACS.

ABOUT the most distinguishing feature which characterizes the exertions of men at the present time is that of co-operation. Not only do men act in conjunction with others at home in attaining desirable and similar ends, but there is growing to be more and more a union of purpose for the attainment of such ends throughout the entire civilized world; and this has already assumed proportions never before known in human history. It is amply illustrated in the numerous international conventions, associations, and congresses, only a few years ago quite unknown, or in embryonic existence only in a few scientific heads too wise to propound such things before the eligible moment.

Now, all this is the best sort of evidence of the world's general scientific growth; for the principle of conjoined and united endeavor is based on the broadest science. If, then, the work in any science, or of any body of scientific men, should be more entitled than another to receive, and more willing to accept, the advantages accruing from co-ordination of effort, it would seem that the exact sciences should have the preference. The resolutions of the International prime meridian conference, held at Washington last autumn, are now familiar to all. The action of the astronomer royal of England, the first of January, 1885, in regulating the time-keepers of the observatory in accordance with these resolutions, may be expected to necessitate further changes in the details of observatory work, and the publication of observations, as also modifications in the printing of nautical almanacs and astronomical ephemerides, or a different understanding of them as now printed.

All these matters ought to be definitely settled at no late day; and, as a large number of governments are interested therein, their representatives should convene in a congress for mutual agreement on the details of the modifications to be made. Such a congress might also deliberate upon the advisability of adopting certain suggested improvements of the Gregorian calendar at the end of the present century. Such power should be granted, that the deliberations of the congress might determine, as well as recommend.

Whatever may be said of the national observatories, we are not sure that the deliberations of such a congress, if conducted on the broadest ground, would not lead to a resolution recommending the discontinuance of two or three of the nautical almanacs now published. In so far as the uses of the navigator are concerned, all nations will now experience the need of a nautical almanac for their several meridians, much the same as all patent-medicine firms and pill-venders feel the need of an almanac and calendar for the conservation of individual interests: it saves themselves and their patrons the indignity of referring to somebody's else almanac, and advertises the fact that they are enterprising enough to have one.

Howbeit, whether or not heroic measures of this sort are advisable, — resulting in a saving to astronomical science of from seventy-five thousand to a hundred thousand dollars a year,

an amount which might be jointly contributed by the several governments to the maintenance of mountain observatories, directed by an international commission, or of an international computing bureau for the complete utilization of the masses of observations accumulating the world over, and for the encouragement of research in theoretic astronomy, — it is certain that the deliberations of such a congress could not fail to advise governmental co-operation in the preparation of the nautical almanacs now existing. National pride aside, and this might be done in a multitude of ways, most prominently in the case of the preparation of the data relating to the moon. Take, for example, the hourly lunar ephemeris and the lunar distances as printed each year in the British nautical almanac and the American ephemeris. These data occupy about one-third of the entire number of pages of each of these publications; they are now prepared independently by the two offices, but are, when printed, substantially identical in both; and, further, the work being done at about the same time in the two countries, the results of the one do not serve any sufficient purpose as a check upon the accuracy of the other. The cost of this part of the almanac alone to each nation amounts to several thousand dollars annually, — an amount which might be reduced one-half by the preparation of these data conjointly, to say nothing of other immediate and favorable results which might be secured by such co-operation.

We should not like, however, to give the impression that this had never been thought of before, nor indeed that steps had never been taken toward securing such co-operation. It is frequently the best policy to let well enough alone; and we do not fail to recognize the fact that it is very often wise to leave a thing as it is, just because it has always been so: in fact, we are conservatives ourselves, though not that precise type of conservative, which, as we speak of the moon, recalls Douglas Jerrold's characterization as one who would "refuse to go out when there's a new moon; and all out of love and respect for that 'ancient institution' — the old one." The wisest conservatism would appear to suggest the annual publication by the nations conjointly of a single volume of astronomical predictions, which, in addition to other improvements, should combine all those desirable features not dependent upon individual meridians, and which in some degree characterize all the astronomical ephemerides of the several governments. The contents and arrangement of the articles of such an ephemeris could only be determined by an international conference. While this may be little better than mere speculation, any one who has the four principal ephemerides in constant use will readily recognize how small a portion of each is employed, and, with extended interpolation-tables, how little the inconvenience of using the ideal ephemeris solely would be.

THE GEOGRAPHICAL WORK OF THE GREELY EXPEDITION.

The general features of the geographical work of the Lady Franklin Bay expedition may be of interest to the readers of *Science*, in connection with the map furnished through the courtesy of Capt. J. R. Bartlett, chief hydrographer U. S. navy. The details are reproduced from photographs of charts made at Fort Conger by the late First Lieutenant James B. Lockwood, U. S. army, of his and my work.

The expedition fitted out by the war department under the supervision of Gen. W. B. Hazen, chief signal-officer, and commanded by me, left St. Johns, Newfoundland, July 7, 1881. After a remarkably successful voyage, the party landed on the shores of Discovery Harbor, just south of Robeson's Channel. The station called Fort Conger was in latitude 81° 44′ north, longitude 64° 45′ west. The site was the same as that occupied by the stores landed from the English ship Discovery, of the Nares expedition, 1875–76. During the autumn, as much work as possible was done towards establishing depots for use of exploring-parties the following spring. The sun, returning after an absence of one hundred and thirty-five days, found the party well and in good spirits. Parties were immediately put into the field to establish advance depots; and

shortly after, two main exploring-parties left the station.

The party under Acting assistant surgeon O. Pavy, U. S. army, which attempted a northing direct from Cape Joseph Henry, failed even to reach the 83d parallel, owing to disruption of the polar pack north of Grinnell Land.

Lieut. James B. Lockwood was ordered to explore the north coast of Greenland. Leaving Fort Conger, April 3, 1882, he crossed Robeson's Channel from Cape Beechy to Cape Sumner, where the main depot of provisions had been established. From that point across Brevoort Peninsula to Repulse Harbor, and thence along the shores of the polar ocean to Cape Bryant, he was supported by three parties of men hauling Hudson-Bay sledges. From Cape Bryant, Lieut. Lockwood and Sergeant Brainard, with Eskimo Christiansen and dog-team, travelled direct across Sherard Osborn Fiord to Cape Britannia. Midway between these capes a sounding was made, but no bottom reached at eight hundred feet. Rounding Cape Britannia Island, which was the farthest point seen even by their English predecessors, they pushed on to the eastward, and later to the north-east, until, on May 15, 1882, Lockwood Island was reached. Its assigned latitude, 83° 24′ north, was the mean of sets of circum-meridian and sub-polar observations. Its longitude was 40° 45′ west. To the north-eastward, land was yet seen, the farthest point being about 83° 35′ north, 38° west. To the south and east, only a confused mass of rounded, snow-covered mountains was visible. The entire coast was rugged and precipitous in the extreme. Strangely enough, but one glacier was observed, although the interior of the country was wholly snow-clad or ice-capped. Along the coast, stretching from headland to headland, was found a tidal crack, which appeared to mark the line of separation between the embayed ice and the paleocrystic pack. In the deep fiords along the coast were seen only level expanses of deep snow, devoid of heavy hummocks or marked ice-foot. In returning, the same route was followed; and on June 3 the party reached Fort Conger in good condition, with the exception of snow-blindness contracted in the last two days' travel.

In April, 1882, with three men, dragging a Hudson-Bay sledge, I succeeded in penetrating into the interior of Grinnell Land. Starting from Fort Conger, we travelled south-westward to Sun Bay, and, passing Miller Island, discovered that we were in a fiord (Chandler Fiord) which terminated to the south-westward in a bay. Passing up the north arm of the fiord, a river was reached, having its source in a glacial lake of great extent. Crossing the lake (Lake Hazen), the farthest point reached was Henrietta Nesmith glacier. The party returned by the same route.

In June, with a party of four men, I succeeded in reaching the east end of Lake Hazen by an overland route. Following that lake to the west, Very River was reached; and following up that valley with one man, I alone attained the summit of Mount Arthur on July 4. From the top of that mountain North Grinnell Land stretched out before me. An enormous ice-cap covered the smooth-topped mountains to the northward of the Garfield and Conger ranges, through the gorges of which numerous and magnificent glaciers pushed southward. To the north-westward the trend of the mountain range indicated its connection with Challenger Mountains of Aldrich, and that the western polar ocean was not far distant.

In 1883 Lieut. Lockwood's attempt to reach the northern point of Greenland was unsuccessful, owing to open water at Black-Horn Cliffs. In consequence, I sent him, on his return, to attempt the crossing of Grinnell Land to the western sea. Accompanied by Sergeant Brainard and a dog-team, he travelled down Archer Fiord, and thence westward *via* Beatrix Bay. They succeeded in reaching Greely Fiord, and followed it some distance westward. From a high mountain, the northern shore appeared to terminate in Cape Brainard, while to the south-west very high land was seen at Cape Lockwood. This land, apparently separated from Grinnell Land, was named Arthur Land. The remarkable feature of this trip was the appearance of the southern ice-cap of Grinnell Land. It presented an average perpendicular front of one hundred and fifty feet.[1]

As regards Grinnell Land, the southerly trend of coast at Aldrich's farthest, the position of Cape Brainard, and the general trend of the land seen by me from Mount Arthur, indicate that the western coast runs quite directly from Cape Alfred Ernest to Cape Brainard.

It is to be noted that Cape Lockwood of Arthur Land is nearer to Lindsay Island and North Cornwall of Belcher than to Fort Conger, our own station.

The considerable extension of Hayes Sound to the westward, by Sergeant Long's journey from Sabine, leaves but a scant hundred miles between its north-westerly point and Cape Lockwood, and but a little farther to the south-

[1] The height of this ice-cap was given at fifteen feet in *Science* of July 25, 1884.

west reaches the waters of Jones Sound in their northern extensions.

The importance of the northern work is not confined, as many think, to the mere planting of the American flag a few miles nearer the northern axis of the globe than has floated the standard of any other nation. Lockwood's journey has gone very far towards settling the much-vexed geographical question, the configuration and northern extension of Greenland. The farthest point seen is scarcely three hundred miles from the land of Lambert, sighted on the east coast in 1670, and less than four hundred and twenty-five from the most northern point of Koldeway and Payer. Of the forty-seven degrees of longitude between Fort Conger and Cape Bismarck, but twenty remain unknown. I venture the opinion that future voyages will confirm the indications growing out of our discoveries, that Arthur Land is separated from Grinnell Land by a fiord or channel connecting the western polar ocean with Hayes Sound. I also think that the northern coast-lines of the Parry Archipelago will be found trending gradually in a northeasterly direction, and terminating in Arthur Land. On these points, as well as on the remarkably fertile belt of iceless country found by me in the interior of Grinnell Land, such as Nordenskiöld hoped to find in Greenland, I trust soon to dwell at length in a forthcoming narrative.

A. W. Greely, *Lieut. U. S. army.*

THE CONFIGURATION OF GRINNELL LAND AND ELLESMERE LAND.

The discoveries of the Greely expedition on the west shore of Grinnell Land are most valuable and important, as there was a vast field for conjecture concerning the configuration of the coast-line of this large island. The exploration of the north shore by Lieut. Aldrich of Nares' expedition proved the improbability of any great extension to the west. The discovery of the west shore at so short a distance as Lieut. Lockwood found it, was, however, quite unexpected. From the description of Hayes Sound, obtained by Dr. Bessels from the Smith-Sound natives, and from information and drawings I received last summer during my stay on Davis Strait from natives who had crossed Lancaster and Jones Sound, and lived on Ellesmere Land, it is possible to learn something more about this long and unexplored coast.

The most exact description I received was from an Eskimo woman whom I met at Cape Kater. She was born at Igluling in Fury and Hecla Strait, had lived some time in Repulse Bay, returned to Igluling, and afterwards crossed the land to Admiralty Inlet, which the natives call 'Tudnunirossirn.' There she lived for a number of years; and about fifteen years ago she started with a party to North Devon, which the Eskimo call 'Tudjan.' There is little intercourse between Baffin Land and North Devon, Lancaster Sound being seldom covered by a solid ice-floe. The north shore of Baffin Land ('Weevang' of the natives) is generally washed by water during the whole winter.

Crossing the sound on sledges, these Eskimo passed a very small island, most probably the rock seen by Capt. Adams in 1871, and in two or three days reached the opposite shore. They did not follow the shores of North Devon, but crossed the ice-covered island on sledges. In four days they reached the north shore, whence a long and narrow peninsula. Nedlung, stretches to Ellesmere Land (their 'Oomingmam nuna,' i.e., musk-ox land). Through the narrow passage dividing Tudjan from Nedlung runs a very strong tidal current, which keeps open a water-hole throughout the winter. All around this place the ice wastes quickly in the spring, and forms a large basin of water abounding with seals. Only that part of the peninsula which lies nearest to North Devon is high and steep, and forms a bold face: farther north it is very low. The length of Nedlung may be about forty miles; its width, three or four miles. West of it there are numerous small islands, called 'Kikkertakdjuin:' to the east there are no islands.

Having reached Oomingmam nuna, the Eskimo fell in with a small tribe residing on this shore. Here they lived for some time, as an abundance of seals was found during the whole year. Farther north-west there is a large fiord, called 'Kangirtuksiak,' off which an island is found, Kikkertakadlinang. The Eskimo did not go to the land on the other side of the fiord, as polar bears are said to be very numerous and large there.

I obtained this information by most careful and minute investigation on every point. I also heard some less detailed descriptions of the journey to Oomingmam nuna by natives of Ponds Bay, who had not been there themselves, but had heard about it from their ancestors; and I may here state that all their traditions and descriptions which I had a chance to verify proved accurate and reliable.

There can be no doubt about the identity of Tudjan and North Devon, as they say that

the land can be seen from Weevang (the north shore of Baffin Land); and many natives have lived there, and have been seen by whalers, and by the expeditions sent in search of Sir John Franklin.

The report on the state of the ice in Jones Sound is very important for the identification of this place. As there is a narrow neck of land connecting Cornwallis and Bathurst Islands, I was rather inclined to judge this to be the place where my Eskimo had been. However, her memory would barely have failed her in recollecting the passage over the ice of Wellington Channel; and besides, the description of the land, Oomingmam nuna, does not agree with Bathurst Island. In Jones Sound, Belcher found open water in May, 1853, at a time of the year when the ice in narrow channels can only be wasted by strong currents. We know nothing about the part of the sound north-east of North-Kent Island, north of which Belcher discovered many small islands. The open water, the narrow passage between North Kent and North Devon, and the many small islands to the north, closely resemble the description given me by the Eskimo woman. It would be very interesting to find that Jones Sound is closed there by a narrow neck of land. The heavy ice Inglefield met with in Jones Sound, in 1852, may have drifted into the sound as easily from Smith Sound as from a sea west of Ellesmere Land.

The last reason leading me to think that Ellesmere Land and Oomingmam nuna are the same, is that the same name is applied to Ellesmere Land by the Smith-Sound natives. In Etah, Bessels met a man who came from Cape Searle, on Davis Strait. He had lived for some time among the Ellesmere-Land natives, and referred to that country as Oomingmam nuna. In the whole of Baffin Land the natives know Oomingmam nuna, and always point it out as beyond Tudnunirn (Ponds Bay) and Tudjan. For these reasons there can scarcely be any doubt that the description I obtained really refers to Jones Sound and the west shore of Ellesmere Land.

The Eskimo of Etah assert that Hayes Sound is a passage leading into the western ocean, and dividing the land west of the Smith-Sound seas into two islands, — Ellesmere Land and Grinnell Land; and there is no reason to doubt their statements. The English expedition under Nares supposed the sound not to be open to tidal currents; Greely's explorations, however, extend it much farther to the west, and are rather in favor of the theory that the sound really forms a passage. The accompanying map presents my views of the probable configuration of the land in this region. DR. FRANZ BOAS.

PALENQUE VISITED BY CORTEZ.

A MEMOIR by Mr. Teobert Maler upon the state of Chiapas (Mexico), published in the July and August numbers, 1884, of the *Revue d'ethnographie*, contains some items of more

than ordinary interest. To one of these — his conclusion that Cortez, in his expedition to Honduras, visited Palenque, and found it then inhabited — I call the special attention of the readers of *Science*.

This conclusion is based chiefly upon his study of Cortez' route in his journey southward. He identifies as Palenque the town which Herrera names Titacat, and which, according to Bernal Diaz, was the first reached after the execution of Cuauhtemoctsin, and where Cortez, unable to rest at night, "went into a large apartment where some of the idols were worshipped," missed his way, and fell some 'twelve feet,' receiving a severe wound in the head, and in reference to which Cortez writes as follows: —

"It is a very beautiful village: it is called Teoticcac, and has fine temples, especially two, in which we are lodged, and from which we have cast out the idols, for which they do not show much regret; for I had already spoken to them of it, and had shown them the error in which they rested, and that there was but one God, creator of all things. . . . I learned of them that one of these two houses, or temples, which was the most important, was sacred to a goddess in whom they placed much confidence and hope, and that they sacrificed to her only young and beautiful maidens. If they were not such, then she would be very angry with them; and for this reason they always took great care to seek them, that she might be satisfied; and they brought up from infancy those who were of good appearance to serve this purpose."

Our author comments on this letter as follows: —

"This description by Cortez applies perfectly to Palenque. There are, indeed, at this place, besides numerous temples and buildings, two principal edifices. One contains the great hall of mural inscriptions: the other is the convent of the virgin priestesses, which has been wrongly taken until now for the palace of the king."

Is this conclusion justifiable? It has generally been admitted that the route followed must have brought the Spanish conqueror within a few miles of this place: hence the opinion advanced cannot be considered as doing violence to the history of the expedition in this respect. If inhabited at that time, it is not probable that he would have approached within twenty-five or thirty miles without visiting it, as it must have been, during occupancy, a place of considerable notoriety and importance.

Stephens was led by his examinations to believe the ruins of Yucatan were inhabited villages and cities down to a comparatively modern date, some of them being occupied until the conquest by the Spaniards. Charney's explorations led him to the same belief. He remarks in one of his letters published in the *North-American review*, —

"It is certain, that, at the time of the conquest, the coast of Yucatan and Tabasco was covered with towns, pyramids, and monuments, all of which were inhabited. And if such were the case with the coast, what is the inference that must be drawn as to the interior? . . . If the palaces of Comalcalco were entire and inhabited at the time of the conquest, we may feel bound to conclude those of Palanque were in the same condition. . . . Altogether, it seems to be sufficiently established that these monuments were inhabited at the date of the conquest, and that they are the productions of a comparatively modern era."

And now Maler, who has gone carefully over the ground in person, and studied the country and the ruins for himself and in his own way, comes to precisely the same conclusion. We are therefore convinced that there is nothing in the age of the ruins to forbid the idea that Cortez visited the place, and found it inhabited.

It is also worthy of notice that Charney agrees with Maler in considering Palenque a 'holy place,' a 'religious centre,' and that the so-called 'palace' must have been 'the home of priests, and not of kings.'

Our author's theory will afford at least a partial explanation of some of the figures found on these ruins; as, for example, the frequent representations of children in the arms of males and females, the repeated occurrence of female figures, and the fact, as shown in Stephens's plates, that the heads of most of these are obliterated, which I have long suspected was due to the fanatical zeal of Catholic priests, who visited the place at an early day. Cortez' visit will furnish a complete explanation of this fact, which does not appear to have attracted the attention its importance demands.

Cyrus Thomas.

DO ANIMALS EXCRETE FREE NITROGEN?

Many of the older experiments upon the nutrition of animals included determinations of the nitrogen of the food and of the visible (solid and liquid) excreta. Almost invariably the latter quantity was notably less than the former, and as a consequence it was commonly held that the difference was excreted in gaseous form through the lungs. In process of time, however, as the methods of experiment were refined, this deficit began to diminish in amount, until now it is indisputably shown that the great difference found by the earlier experimenters was very largely due to mechanical losses of the excreta. A certain insoluble residue, however, still remains, which has been the occasion of not a little contro-

versy among physiologists; one school maintaining, and another denying, that it is to be interpreted as showing an excretion of gaseous nitrogen.

There is one fact which renders the results obtained by the experimental method just mentioned inconclusive either for or against an excretion of free nitrogen: it is that the animal experimented upon may either gain or lose nitrogenous matter from the tissues of its body during the experiment. If the former take place, the excretion of nitrogen is diminished by that amount: if the latter happen, it is increased. But, while such gain or loss of nitrogenous matter by the body may undoubtedly take place, we have no means of proving that a small gain or loss has or has not occurred in any given experiment. If in some trial the nitrogen of the excreta exactly equal that of the food, the advocate of the excretion of gaseous nitrogen can say that a certain (unknown) amount of nitrogen *may* have been lost from the body of the animal, and, by chance, the same amount *may* have been excreted as gas. If an experiment show a deficiency of nitrogen in the excreta, the denier of the excretion of free nitrogen can say that exactly that amount of nitrogen *may* have been gained by the animal. Plainly, neither of these possibilities can be either proved or disproved by this method of experiment.

A resort to an investigation of the respiratory products naturally suggests itself. The experiment, though a difficult one, has been made; but the results have not, as might have been hoped, sufficed to decide the question definitely.

It should be remembered that the amount of nitrogen excreted as gas must, in any case, be small. The large deficit found by the earlier experimenters is universally acknowledged to have been erroneous. Bearing this in mind, it is evident, that, as already pointed out, a single experiment by the first method has comparatively little weight. But very many such experiments have been made, and, when properly made (i.e., on mature animals, with food just sufficient to maintain them without gain or loss of weight), they all agree in showing a very small difference between the nitrogen of the food and that of the excreta; and, moreover, the difference is sometimes in one direction, and sometimes in the other. For example: out of forty-three experiments by various observers, whose results chance to lie before me, nineteen show an excess of nitrogen in the excreta, and twenty-four a deficiency, as compared with the nitrogen of the food. The excess varies from 0.07% to 6% of the total nitrogen fed; and the deficiency from 0.02% to 6.7%. Many more observations might be quoted to the same effect. Such results as these have a cumulative force, and go far to establish the hypothesis that there is no excretion of gaseous nitrogen.

Some of the believers in an excretion of gaseous nitrogen, particularly Seegen and Norwak in Vienna, have attacked these results upon the side of the analytical methods employed, claiming that the process (soda-lime process) used for estimating nitrogen gives too low results. It has been shown, however, by several chemists, that this is not the case when the process is properly performed; while some recent trials by Gruber[1] show, that, when the so-called 'absolute method' for nitrogen is employed, substantially the same results are reached.

The main reliance of those who believe that animals excrete free nitrogen, however, is upon respiration experiments, nearly all of which appear to favor their view. These experiments are made substantially in the following manner. The animal breathes in a confined volume of air of known amount, whose exact composition is determined by analysis before the experiment begins. As the oxygen of the confined air becomes exhausted, measured quantities of pure oxygen are admitted from a gas-holder, while the carbonic acid which is exhaled is absorbed by caustic potash. At the close of the experiment the air in the apparatus is again analyzed; and the observer then proceeds to compute, from the data he has secured, the amount of nitrogen originally present in the air within the apparatus, and the amount remaining at the close of the experiment. If the latter quantity is found to be the larger, it shows (barring experimental errors) that the animal has exhaled gaseous nitrogen.

Almost, if not quite, every experiment made on this plan has shown an apparent small excretion of free nitrogen. Thus the well-known experiments of Regnault and Reiset appear to show an excretion of free nitrogen by various animals. In their experiments with small animals the amount was relatively small; and sometimes an absorption of nitrogen was observed, especially during hunger. In experiments with larger animals (sheep and calves), in a larger apparatus, the apparent excretion was quite considerable.

Seegen and Norwak in Vienna have reported numerous trials with a simplified form of Regnault and Reiset's apparatus, all of which show an apparent excretion of nitrogen; and a lively debate has been carried on between them and Voit, each party endeavoring to explain away the results of the other.

Some recent experiments by Leo[2] are of much interest in this connection. He worked with rabbits, which were tracheotomized and supplied with pure oxygen. After sufficient time had elapsed to remove all free nitrogen from the lungs, the expired gas was collected, and found to contain nitrogen corresponding to an excretion of over 8 mgr. per hour and kilogram of body-weight. This result was obtained when the animals were located in free air. In a second series the head of the animal was cemented into the apparatus. The excretion sank to 2–3 mgr. per hour and kilogram. Finally, in a third series, the whole body of the animal was immersed in a warm bath in order to hinder possible diffusion of atmospheric nitrogen into its cavities, and the excretion was reduced to 0.3–0.5 mgr. per hour and kilogram, or to about one-twelfth the amount found by Seegen and Norwak.

It thus appears that the greater the care taken to

[1] *Zeitschr. für biologie*, xvi. 367.

[2] *Jahresber. thier. chem.*, xi. 382.

exclude atmospheric nitrogen from the apparatus employed, the less becomes the apparent excretion of nitrogen by the animal. This, taken in connection with the similar fact already mentioned, regarding the results of experiments by the other method, is significant. If, as we increase the delicacy of our experimental methods, the apparent excretion of free nitrogen becomes less and less, it is not a very bold assumption which regards it as entirely due to the unavoidable errors of experiment. That such is the case is perhaps not proven, but the weight of evidence is decidedly in favor of that belief.

H. P. Armsby.

THE BRITISH NAUTICAL ALMANAC.

We have received promptly, as usual, the "Nautical almanac and astronomical ephemeris for the year 1888, for the meridian of the Royal observatory at Greenwich," the contents and arrangement of which are announced to be the same generally as those of the preceding year. We find no changes in the adopted astronomical constants, nor have any new prediction-tables been substituted for those which have now been employed for many years. The early Struve constant of aberration is not replaced by the recent Pulkowa determination, and Newcomb's mean equatorial horizontal parallax of the sun, 8.848″, is wisely retained. The fundamental elements of the moon's position in space are derived from Hansen's tables unaltered, and the apparent positions only are modified by Newcomb's corrections, — a method of procedure which seems to be best adapted to the needs of the future investigator.

For the first time in the history of nautical almanacs, the positions of all the great planets were derived from a uniform system of tables, and so published in the British 'Nautical almanac' for 1882; and the use of these same tables is still adhered to. These are the planetary tables constructed by the late Leverrier, and printed in the fifth, sixth, twelfth, and fourteenth volumes of the 'Annales de l'Observatoire impérial de Paris.' The derivation of the times of the phenomena of Jupiter's satellites is based on the 'Tables écliptiques des satellites de Jupiter, par le Baron de Damoiseau,' Paris, 1836. Professor Adams's extension of these tables, now employed in the British 'Nautical almanac,' will expire in two years more.

This ephemeris is now most deficient in its list of standard stars, the number and relative positions of those in the list being entirely inadequate to the needs of field and observatory work. Catalogues of stellar co-ordinates of high precision are now so numerous that there would seem to be no good reason why the British 'Nautical almanac' should hesitate in following the 'Berliner astronomisches jahrbuch,' the 'Connaissance des temps,' and the 'American ephemeris,' all of which have within a few years adopted very full lists of standard stars. Also great improvements might be suggested for other parts of the work.

Ever since the year 1834, when the English 'Nautical almanac' became an astronomical ephemeris as well, the management of this publication has been characterized by a conservatism, which, in these times of change just for change, is delightful to behold. But even conservatism may be unwise; and, if the British 'Nautical almanac,' as an astronomical ephemeris, is to hold in the future the place it has held in the past, a committee of reconstruction, somewhat like that 'relative to the improvement of the Nautical almanac' in 1830, would seem to be required to effect the needed modifications.

David P. Todd.

CONTAGIOUS DISEASES OF DOMESTIC ANIMALS.

The agricultural department at Washington has just issued a volume of some three hundred and fifty pages devoted to the above subject, as the result of the investigations of its veterinary division, — an office distinct from the more newly established 'bureau of animal industries.' The subject-matter, being made up of the reports of the veterinarian-in-chief and his assistants, is of a sort that will, in a way, be interesting and instructive reading for veterinarians, and to a certain extent for comparative pathologists.

The volume opens with a description of a 'veterinary experimental station' recently located, in connection with the department, near Washington, which seems to afford abundant facility for the proposed work, and from which, in the future, much that will tend greatly to aid in protecting our animal interests from the ravages of disease will undoubtedly result. Then follows a detailed report of outbreaks of contagious pleuro-pneumonia among cattle in Connecticut, New Jersey, Pennsylvania, and Maryland. These have an historical interest, but nothing more, because these states have repeatedly been shown to contain this exotic disease; and it has just as repeatedly been shown that a more or less constant interchange of it goes on with the natural traffic of cattle within their borders.

An exceedingly interesting and carefully written report is made by Dr. Salmon upon an enzoötic outbreak of ergotism among cattle in Coffey county, Kan. It is very much to be regretted, for the sake of the department, the cattle interests of Kansas, and the veterinary profession, that, under the circumstances, Dr. Salmon did not himself attend to the matter when first it was reported to be an outbreak of 'foot and mouth disease,' instead of trusting so important a decision to such an unsafe man as 'V.S.' Trumbower proved to be, who, by his own report of the matter given in this same volume, seems to have arrived upon the ground on the afternoon of March 8, to have examined the cattle and their surroundings carefully, and to have then entertained the opinion that the trouble was due to 'foot and mouth disease,' until the 20th of the same month, when he was joined by Dr. Salmon. He then suddenly became as firmly convinced that the trouble was due to ergotism. Is

the department employing unqualified men in this work?

An examination was made to ascertain whether the hay used in Kansas, Missouri, and Illinois, contained ergot, and it was found that several grasses were badly infected with it; and a plate is given showing infected spikes of wild rye, timothy, red-top, and blue grass. It is stated that the proportion of ergot in some spikes of wild rye was ten or twelve per cent of the weight. A chapter is devoted to the nature, chemical composition, and action of ergot. In this chapter is an account of the ergot fungus (Claviceps purpurea), taken from botanical sources, and a plate is given showing the microscopical characters of the fungus. By some oversight, this plate, which is copied from Tulasne, is said to have been drawn from nature by Marx.

The ten pages devoted to 'investigations of swine-plague' are largely made up of a review of the work of Klein and Pasteur upon the same subject, with an insistence upon Dr. Salmon's claim to priority in the discovery of the organism said to be the cause of the disease. A few additional experiments are given tending to show that the specific cause lies in the action of a micrococcus arranged in pairs; and the statement is made that 'a large number of similar observations have been made,' but they are not detailed.

The main objection to be made to the experiments is to the use of *fluid*-culture media, which may be depended upon to give results, to be sure, but not always such as are satisfactory. Solid nutritive materials are by far the easiest in which to detect impurities; and by their use the study of the life-history of any particular bacterium may be carried out with much greater precision. We are aware that Dr. Salmon objects to the use of solid media, but, so far as we have seen, he has not stated the grounds of his objections.

It is impossible to criticise fairly a summary of results without complete knowledge of the experiments by which they were reached. It is stated that "the first annual report of the Bureau of animal industry, which will contain a detailed statement of the investigations made, . . . will be submitted . . . at the close of the year." We await its publication with interest, in the hope of obtaining that detailed statement free from criticism upon others. A direct and simple statement of work done and observations actually made is the method of real progress in the study of the bacteria. One's critics may be trusted to discover the merits or faults that may exist in comparison with the works of others.

A good translation by Mr. Theobald Smith, of Megnin's recent article on the gape-disease in fowls, and its accompanying parasite, which follows, will be of very general interest, and can be read with great profit by those interested in the general subject in all portions of the country.

A long report of the doings of an international veterinary congress, held at Brussels during September, 1883, by Prof. J. Law, seems rather out of place in the volume, because, of all the subjects considered, only one, 'The organization of a veterinary service,' could properly be brought to the notice of the commissioner of agriculture. It is interesting and instructive as showing how far ahead of us the nations of Europe are, in giving attention to the protection of their animals from disease, and what great resources they have in their state veterinary schools, from which to draw *proper* material for their state veterinary service.

Mr. J. H. Saunders's report of his trip to Europe is chiefly valuable and interesting in connection with information which he was able to gather in France regarding the Percheron horse; and his remarks should be read by those who contemplate making importations of these animals, or of any other breed of French horses. Mr. Saunders went to London, and travelled over the same ground in the veterinary privy-council office that had been gone over by agents of the agricultural department before, and with the same results; viz., our beef animals would be admitted free from the 'slaughtering restrictions' when we could show a clean bill of health, and not before. Also 'foot and mouth disease,' as landed in our cattle there, was contracted on board ship during the voyage, the ship having received the infection from British cattle.

Dr. H. J. Detmers gives a very unsatisfactory report of investigations made by him in Texas, of southern cattle-fever. One of his assertions, not in the least proven, however, is, well — new, to say the least; viz., that the virus of this disease is in the saliva of the southern animal. Such assertions, unless made for good and well-shown reasons, are to be deplored as tending rather to hide, than make clear, the very points for the elucidation of which the whole work was ordered done.

A very able paper upon trichiniasis, by Dr. Salmon, is reprinted from the report of a special commission upon the swine industry of the United States, and added to the volume, which closes with the usual reports from the unprofessional correspondents of the department concerning the general health of all kinds of farm animals throughout the country.

THE COAL QUESTION IN ENGLAND.

THE very serious problem of coal-supply has received a thorough review in a recent number of *Nature*. In 1861 the question was considered by Mr. Hull, who estimated that the available coal in Great Britain represented a total amount of 79,843,000,000 tons, which, consumed at the annual rate of 100,000,000 tons, would last about eight centuries. This estimate was later proved to be too high; and in 1871 a commission, appointed to investigate the question, reported that in England there were about 90,207,000,000 tons of coal developed, and about 56,273,000,000 yet unopened, making a total of 146,480,000,000 tons of available coal. Subsequent investigation proved this to be somewhat exaggerated. In these estimates thin seams less than a foot thick are not included,

and the strata are estimated to end at 4,000 feet in depth. Even if they do extend deeper, mining would be impracticable because of the expense; and, besides, the temperature would be 116° F. The deepest coal-pit in England is 2,448 feet, but one in Belgium extends 3,490 feet.

In 1881, 154,000,000 tons were extracted, — enough to build fifty-five great pyramids, or rebuild the great wall of China and add one-quarter to its length. The total amount of coal mined since 1854, would build a column 9 feet 4 inches in diameter, a distance of 240,000 miles, i.e., to the moon. The output shows considerable fluctuation from year to year, — as might be expected from the variety of accidental circumstances, such as new inventions, the mean annual temperature, and the state of trade, — but, on the whole, a very rapid increase; the output f 1875 being double of that for 1854, and that for 1883 double of that for 1862; and, if the amount extracted increases at this rate (3,000,000 tons annually), the supply will be exhausted in the year 2145 A.D. The exhaustion will be theoretical only; for in a comparatively short time the price of coal will increase, and the demand necessarily lessen, so that coal will never be exhausted. One of four things must then happen, — either some new source of energy must be supplied, or a larger per cent of the coal must be utilized, or coal must be imported, or England must give up her manufactories. It is doubtful if any new source of energy on a large scale will be discovered, unless some explosive be used for the purpose. According to Sir William Thomson, energy in the form of electricity can be transferred three hundred miles through a copper rod, with a loss of only twenty per cent: so in this way waterfalls may be utilized in the future.

While it is hardly possible to use less coal, we may get more energy out of it; for at present, out of a theoretical 10,000,000 foot-pounds of work which one pound of coal can supply, we only get 1,000,000 foot-pounds. But instead of a decrease in the waste, there is likely, on the contrary, to be an increase; for each year faster speed is demanded by rail, and steamships are rapidly replacing sailing-vessels. It might be possible to prevent the annual exportation of 22,880,000 tons by export duties; but that does not seem expedient. The idea of importation is hardly practicable, for the nearest coal-mines of any extent are in Canada and the United States. The former are not easy of access, but are almost unlimited; and those in the United States contain at least thirty-eight times as much coal as those in England. To supply England with the necessary coal, 2,100 ships as large as the Faraday, each carrying 6,000 tons and making thirteen trips a year, would be required. The cost would be necessarily greatly increased. In former times, England produced its own breadstuffs: now the greater part is imported. If coal becomes scarce, there will be no way of paying for food, emigration will begin, the death-rate will increase, the birth-rate decrease, and England will change once more to an open, cultivated country, devoid of all other industries.

PREHISTORIC AMERICA.

This translation of Nadaillac's 'Prehistoric America,' we are told, is made with the author's sanction; and it is also by his permission that certain portions of the work have been so 'modified and revised' as to bring them "into harmony with the results of recent investigation, and the conclusions of the best authorities on the archaeology of the United States." Speaking in a general way, these changes and additions may be said to be confined almost entirely to the chapters that relate to North America, and to consist, not in the discovery of new truths, although some additional facts are offered, but in the adoption of certain theories, as positive conclusions, which, in the original publication, are given as explanations, more or less probable, of the points at issue. Thus, for instance, in that portion of the work which refers to the origin and antiquity of man in America, we are given to understand that he is probably of Asiatic descent, all other theories being practically ignored. To this explanation, considered simply as such, we do not object. Appearances certainly favor it; and as it is the most satisfactory way of accounting for his presence here, and for certain peculiar features in his civilization, we do not see any reason why it should not be accepted, at least until something better is offered. That his ancestors arrived here at a period so remote that it can only be measured by geological epochs and phases of civilization, is conclusively proved; and though it is not equally susceptible of demonstration, yet we think it highly probable that these immigrants may have started from different centres, and gradually pushing their way westward across Bering Strait, and by way of the Polynesian Islands, may have landed at different times, and at different places, on the shores of both North and South America. That they belonged to different races, and were in different stages of development, is possible; and whilst we are willing to admit that "the culture which can be traced from the shell-heap to the mound, from the mound to the pueblo, and from the pueblo to the structures of Mexico, Central America, and Peru, is distinctively American," we may be pardoned for suggesting that it is possible, in view of what is said of the facilities of intercourse, not only between our tribes but between the continents, that this culture may have been colored by Asiatic influences of a comparatively recent date.

Prehistoric America. By the Marquis de Nadaillac. Translated by N. D'Anvers. Edited by W. H. Dall. New York, *G. P. Putnam's sons*, 1884. 566 p., illustr. 8°.

In the chapters that relate to the archeology of the Mississippi valley we are fortunately on safer ground. The arts and industries of the recent Indians, as seen in their ornaments and implements, and as described by the early chroniclers, furnish a convenient standard by which to fix the place of the so-called mound-builders in the scale of civilization; and a comparison of these remains with the mounds and their contents enables us to say with certainty that these two peoples, admitting them to have been distinct, had attained to about the same stage of material development. Indeed, the two classes of remains are believed to agree in every essential particular. Not a single specimen has yet been taken from the mounds, that indicates a different phase of civilization from that which the Indian is known to have reached, — nothing which he could not have made, or might not have bought from his neighbors in Mexico or on the Atlantic seaboard. This is certainly an important link in the chain of evidence that points to the identity of the Indians with the mound-builders; and if we add to it the fact that the Indians are admitted to have built both mounds and embankments, and that "they are the only people except the whites, who, so far as we know, have ever held the region in which these remains are found," it will be seen that there is ample ground for the conclusion that the mounds and enclosures of the Mississippi valley, of every sort and size, "were the work of these same Indians, or of their immediate ancestors." All other inferences are denied to us until it can be shown, that, at some time in the past, there lived in this valley a people other than the Indian, who had reached the same or a higher stage of development. To say, as is sometimes done, that such a people may have lived here, — and, for that matter, it is as easy to *suppose* a dozen or two of them as one, — may be very true, but it does not meet the point. Suppositions are neither facts nor arguments; and, unfortunately for the advocates of this theory, the modern school of ethnologists has a decided preference for the last two. Until, then, it can be shown that there lived here, in prehistoric times, some other people, who chipped flints, wove cloth, hammered metals, worked in stone, manufactured pottery, built mounds and earthworks, and did all the other things that the 'red Indians of historic times' can be proved to have done, it will not be necessary to go any farther, or to waste any more time in search of a mound-builder.

In dealing with the architectural and other prehistoric remains of Arizona, Central America, and Peru, the same method of investigation is followed with equally satisfactory results. The cliff-dwellers, considered as a separate and distinct people, with a civilization different from that of the Pueblo Indians, are made to take a place by the side of the mound-builders, in the limbo of exploded theories; the deserted cities of Mexico and Central America are found to be nothing but the abandoned dwellings of a people whose mode of life, as Bandelier well says, "differed from the communal life of the Indians in other regions only by the exigencies of another climate and of varying natural resources;" and the ruined temples, palaces, and fortresses of Peru, stripped of all exaggeration, and measured by the same unfailing standard, are recognized as a striking but legitimate product of the civilization which was in existence there at the time of the conquest, and which, in many of its features, was but a counterpart of that which prevailed in Mexico, and, we may add, in the regions to the east of the Mississippi.

This is a brief summary of some of the conclusions reached in the present volume, or which may be deduced from the premises here laid down; and, to those of us who have watched the progress of anthropological studies in this country for the past few years, it is needless to say that they represent the current scientific opinion of the day. Indeed, it could not well be otherwise, since they are the logical results of the application to American archeology of the method of investigation which has been in use everywhere else, and which is the only one that promises to lead to any thing satisfactory. The old plan of inventing a new civilization, or resurrecting an extinct people by way of accounting for every differently shaped pot that happened to turn up, has been tried, and found wanting; and we have at last adopted a system of classification and comparison that enables us to connote the relations between people and things, to fix their several values, and assign them their relative places in the scale of progress. Squier began the good work many years ago, but failed to carry it to a logical conclusion. When the mantle fell from his shoulders, Morgan picked it up; and, though he sometimes swung the pendulum too far in his direction, yet there can be no doubt as to the tremendous impetus he gave to the study. Following him came the Bureau of ethnology at Washington, the Peabody museum at Cambridge, the Archaeological institute of America, and the Société des Américanistes in Europe; and it is to their systematic exertions in the collec-

tion of data, joined to the individual researches of a band of enthusiastic students abroad, as well as in our own country, that we owe this the best work on prehistoric America that has yet been published.

But whilst we thus gladly bear witness to the merits of this work, we must not forget the marks of carelessness which frequently disfigure its pages. Quotations and references are incorrectly given. Writers whose statements are more than doubtful, are given a prominence which they do not deserve; and there are assertions like the one (p. 82) as to the relative antiquity of the mounds in the Southern States, which needs proof, or that on p. 381, in regard to 'tempering' copper, which may or may not be true, depending on what is meant by the term. Finally, we must protest against the reference (p. 64) to the dogma of transubstantiation. Since that article of belief is held by rather more than half the Christian world, an offensive reference to it by the editor is not only uncalled for, but in excessively bad taste.

[The editor gladly inserts this review, written at his solicitation; but he does so without committing himself to the advocacy of the views therein expressed, which seem to maintain the identity of all peoples that ever inhabited the American continent up to the advent of Europeans. It seems to him that the progress of science demands that this should be looked upon as a question to which investigation may still be directed. While historical evidence, on which the reviewer lays such stress, undoubtedly gives the clew to recent peoples, we must certainly depend on archeological research for the data by which to decide all questions which concern the origin and relationship of those which preceded them.]

A HANDBOOK OF HEALTHY AND DISEASED MEAT.

In Germany there is no need that an official should be ignorant of the duties he has to perform; for, no matter in how restricted a sphere he has to work, there are extended treatises covering the exact points, with which he should be acquainted. In the volume which lies before us, the inspector of meat, or the veterinarian who may be called upon to decide upon the fitness of animal flesh for human food, would find a good practical guide to the work.

The first part of the volume is devoted to a consideration of the morphology and chemistry of meat, with remarks on its general physiology and pathology. Then follow a practical description of the different kinds of food animals, and the various methods of killing, and of cutting up and preserving the flesh. After this is a chapter chiefly devoted to healthy meats and the changes which the different sorts undergo in digestion.

The last half of the book treats of diseased meat and the dangers of its use. In this lies the value of the work; as the special appearances, and the methods for their detection, are given in connection with each disease, as well as the disorders which may arise in man following their use as food, together with the means of prevention. Finally there is appended a digest of the laws of Germany and Austria regulating inspection.

The book is one which can scarcely be said to be of general scientific interest; and, on account of the language in which it is written, it will probably not be widely read by the class of men in this country to whom it would be of the greatest value. From a pecuniary point of view, a translation of such a work would not pay here at present; but from the economic interests which are connected with the subject, and the great protective influence which a well-maintained inspection of meat through our country would exert upon the public health, an edition in English, translated and published under the auspices of the proper department of the national government, would be of great and peculiar interest in the hands of the proper officers of our local boards of health.

Handbuch der fleischkunde. Eine beurtheilungslehre des fleisches unserer schlachthiere, mit besonderer rücksicht auf die gesundheits pflegedes menschen und die sanitätspolizei. Von Dr. Adolf Schmidt-Mülheim. Leipzig, *Vogel*, 1884. 8°.

THE AMERICAN SOCIETY OF MICROSCOPISTS.

The American society of microscopists has published the account of the meeting held last August at Rochester. The volume is a neat octavo of nearly three hundred pages, with a few plates, and appears in part as a memorial of the late R. B. Tolles, whose lithographic portrait is prefixed to the titlepage. The portrait is such that its total absence will appear desirable to many. The address of the president, J. D. Cox, is substantially a review of the arrogant and ignorant attacks which Wenham repeated during so many years against Tolles's wide-angle lenses; and the contrast between

Proceedings of the American society of microscopists. Seventh annual meeting. Buffalo, *Bigelow bros., pr.*, 1884. 4 + 300 p., [6] pl., illustr. 8°.

the bitter injustice of the English writer and the calm impersonality of the American optician, who was in the right, is skilfully woven into a tribute to Tolles's character. There follows a short appreciative memoir of Mr. Tolles by Dr. George E. Blackham.

The remainder of the volume is occupied by the papers and proceedings, and contains exceedingly little original matter. There are articles which repeat in detail perfectly familiar modes of work, and others which deal with those vague and worthless generalities of commonplace which characterize half knowledge. Of the latter, the essay by Dr. J. Redding is a too perfect example. It is on the extra-vascular circulation, and is largely formed of commonplaces, the rest being half truths and total errors. For example: Dr. Redding says (pp. 85, 86), "Bile, gastric juice, in fact all of the so-called secretions, together with the worn-out and effete tissue-detritus, are the result of physical disintegration of the outermost substance of the cells." What can one do to help the author? Perhaps print the whole sentence in italics, to point out the parts of it which are erroneous. We find, however, several articles of real interest. Some new appliances for convenient work are described. Gundlach's suggestion of a new method of construction for objectives of low power, with increased angular aperture, by changing the crown glass of an achromatic lens, and adapting the flint glass to it, is noteworthy, and may lead to a valuable improvement. Attention should also be called to the very deserved criticism, by Edward Bausch, of the English 'society screw,' which is every thing save a good standard. It is much to be regretted that the volume contains so very little of results of original research.

THURSTON'S METALLIC ALLOYS.

IN this volume are brought together the results of the author's work[1] on metallic alloys, with an introductory chapter on the history and characteristics of metals and their alloys, which is in the main the same as that to part ii., and two chapters, one containing an enumeration of the uses of the non-ferrous metals, and a statement of the location and reduction of their various ores; and the other, interesting descriptions of the newer methods of working hot and cold metals.

The scientific value of the experiments, whose record and discussion constitute the principal features of the book, and which were confined to the mechanical properties of commercial copper, tin, zinc, and their alloys, — attention being chiefly given to the strength and elasticity of these alloys when subjected to tensile, compressive, bending, and twisting forces, — is diminished by the failure to exercise due care in the preparation of the alloys. The need of great care in this matter is recognized and emphasized by investigators, for most alloys exhibit phenomena of liquation; that is, they tend, when melted and about to solidify, to separate into their constituent metals, or into several masses composed of different alloys. Special precautions with respect to purity of the metals, rate of cooling, oxidation, temperature during melting, frequency of agitation, etc., must therefore be taken, if the resultant solidified mass is to be homogeneous.

Professor Thurston is fully aware of this liability to liquation; but on "assuming charge of a series of experiments on the characteristics of alloys, and an investigation of the laws of combination," the duty assigned him by the U. S. board, we find him holding the following view of the work: —

"The intention in the work here to be described was, not to determine the character of chemically pure metals, melted, cast, and cooled with special precaution, but to ascertain the practical value of commercial metals, as found in the markets of the United States, melted in the way that such alloys are prepared in every foundry for business purposes, and cast and otherwise treated in every respect as the brass-founder usually handles his work; and to determine what is the practical value to the brass-founder and to the constructor of commercial metals, treated in the ordinary manner, and without any special precaution or any peculiar treatment."

The book will be acceptable to the engineering public; for, besides the author's own work, it contains the views and results of other investigators, extensive tables on the physical and mechanical properties of bronzes and brasses, and Bolley's compilation of the technically useful alloys, the author increasing this rich collection still further by recipes from French and American sources. The determination and topographical representation of 'the strongest of the bronzes' will also be found of decided interest.

The materials of engineering. Part iii. *Non-ferrous metals and alloys.* By Prof. R. H. THURSTON. New York, *Wiley*, 1884. 14+675 p., illustr. 8°.

[1] Reports of U. S. board to test iron and steel, etc., vol. i. 1878, and vol. ii. 1881.

THE PRINCIPLES OF CHEMISTRY.

To most persons, and indeed to most chemists, chemistry is the science which has to deal only with the composition of bodies. No one can doubt the prime importance of the science regarded from this stand-point; but it may fairly be asked whether the determination of the composition of bodies is the final object of chemistry, even if by composition we mean not only the kinds of matter of which the bodies are made up, but the arrangement of their smallest particles.

The determination of composition in this broad sense forms the principal work of the chemists of the present generation, and of many generations past. In a rough way, to be sure, attempts have been made to discover the laws which govern the changes in composition which bodies undergo, but our knowledge of these laws is as yet extremely limited. It is the discovery of these laws which forms the highest object of chemistry. It is one thing to know, that, when hydrogen and oxygen are brought together under certain circumstances, water is formed, and that under certain other circumstances water can be decomposed into hydrogen and oxygen. It is another thing to know something about what takes place in the interval between the disappearance of the hydrogen and oxygen and the formation of the water, or *vice versa*. We have here to deal with a natural phenomenon, which should be studied as other natural phenomena are studied; as, for example, the falling of bodies, etc. Suppose that in studying the falling of a body we should confine our attention to the body at rest before it falls, and after it has fallen, how extremely imperfect our knowledge of the phenomenon would be! It is plain that we could never discover the laws of falling bodies by such observations; and yet our observations in the case of chemical phenomena are almost exclusively of this kind. The reason is, that chemical action usually takes place so rapidly that it is practically impossible to make accurate observations during its progress. Of late, however, there has been a marked tendency to the study of the course of chemical reactions; and the indications are clear that chemists are beginning to give the subject of chemical action as such more serious attention than has heretofore been the case.

The book before us has largely to deal with the recent developments in the scientific study of chemical phenomena, and with well-known facts and hypotheses which have a bearing upon the deeper problems of chemistry. In his zeal for the new work, the author is perhaps now and then unfair towards the old; but in general he gives evidence of a spirit of fairness, and a desire to weigh conscientiously the facts and the inferences which they seem to permit. As regards the subjects treated in the book, we quote from the preface: —

"The book is divided into two parts. The first part is occupied with the statement and discussion of the atomic and molecular theory, and the applications thereof to such subjects as allotropy, isomerism, and the classification of elements and compounds. Somewhat full accounts are also given, in this part, of thermal, optical, and other departments of physical chemistry, in so far as the results and methods of these branches of the science are applicable to the questions regarding the composition of chemical systems which are connoted by the term 'chemical statics.'

"The second part of the book is devoted to the subjects of dissociation, chemical change and equilibrium, chemical affinity, and the relations between chemical action and the distribution of the energy of the changing system. These and cognate questions I have ventured to summarize in the expression 'chemical kinetics.'"

The first part gives us a clear treatment of the subjects of atoms and molecules, and the structure of molecules. The chief characteristic of the author's method of treatment is an absence of dogmatism, and a clear determination to be governed by facts, and not by hypotheses. We commend this part of the book to advanced students of chemistry who have become contaminated with the dogmatic methods which are so much in vogue. We earnestly beg our teachers to study it, and, if possible, to profit by it.

In the second part of the book are found chapters on subjects which are not commonly treated in text-books of chemistry. The researches of Guldberg and Waage, and of Ostwald, of Pfaundler, Horstman, and Willard Gibbs, are fully and clearly treated for the first time in a chemical text-book in the English language, and treated in such a way as to convey a correct idea in regard to the relations of the various investigations to the general problems of chemistry. The chapter on affinity is worthy of special mention and of special study.

It may be questioned whether, in his views regarding valence and structure, the author does not allow himself to be carried too far. Thus, p. 463, we read, —

"When . . . we do not know the molecular weights of compounds in the state of gas, conclusions regarding the structure of the molecules of these compounds are very apt to degenerate into

A treatise on the principles of chemistry. By M. M. Pattison Muir, M.A., F.R.S.E., fellow and praelector in chemistry of Gonville and Caius college, Cambridge. Cambridge, *University press*, 1884. 24+488 p. 8°.

mere exercises of the fancy. Indeed, the use of the expression 'structure of molecules' is in such cases quite unwarranted."

There is undoubtedly a sense in which the last statement is true, but there is another sense in which it is not true. We may know a great deal about the chemical conduct of a compound, — enough, indeed, to warrant us in partially expressing its structure in a formula, without positively knowing its molecular weight. The reason why "conclusions regarding the structure of the molecules . . . are very apt to degenerate into mere exercises of the fancy," is not so much that the molecular weights are unknown, but rather that the true signification of structural formulas is not understood, and formulas are frequently constructed on an entirely inadequate basis of facts.

Taken all in all, the book is deserving of the highest praise, and its influence can only be beneficial. It will arouse opposition, but it will at least cause those who oppose it to think; and, if it should do this, it would be of value, though every word were false.

NOTES AND NEWS.

MR. H. L. BIXBY of Chelsea, Vt., is taking steps to introduce a system of weather warnings throughout his state by means of blasts from factory-whistles. The signals are as follows: after the first long, unbroken blast, usually given at about seven A.M., a single five-second blast indicates fair or probably fair weather for the day; two blasts, foul weather; three, fair changing to foul; four, foul changing to fair; five, doubtful or irregularly variable. After any of these, five short blasts signify a cold wave or unseasonable frosts. The managers of the *Free press* at Burlington undertake to send the necessary telegrams on payment of a small fee. Randolph is the first town to adopt the system: the signals are regularly given there now from a ten-inch steam-whistle.

— Herr J. Brautlecht has been experimenting on the transfer of bacteria from the soil to the atmosphere. Ignited sand, gravelly soil, and a moderately clayey garden-soil, were moistened with liquid containing bacteria, and covered with glass bells. In a few hours microbia of the same kind as those contained in the liquid were found in great numbers in the moisture condensed on the sides of the bell. It will be remembered that Angus Smith was one of the first to point out that aqueous vapor condensed on the walls of rooms contains micro-organisms.

— The Nitrate owners' committee of Tarapaca have determined to offer a prize of a thousand pounds for the best essay on the employment of nitrate in agriculture, so as to supplant other fertilizers. The essay is to be published by the committee in all modern languages. Moreover, five hundred tons of nitrate, subscribed by the manufacturers, are to be shipped to Europe and the United States, to be employed in experiments at the expense of the committee. A fund of four thousand pounds has been formed to carry out these various schemes, the object of which is to promote a demand for the nitrate.

— Dr. Edward Divers, principal of the Imperial engineering college of Tokio, Japan, writes to the *Chemical news*, informing the editor of a serious accident which threatens to deprive him of the sight of one eye. He is anxious to put chemists and others on their guard. A bottle containing phosphorus trichloride had done duty for many years as a specimen for the lecture-table. Dr. Divers was carefully warming the neck of the bottle to liberate the stopper, when the bottle burst in pieces with great violence, the cornea and iris of the right eye being extensively wounded, and the aqueous humor discharged.

— A sensation has been caused in Australia by the discovery of the gold-field at Mount Morgan, near Rockhampton, in Queensland. The mine, it is estimated, contains gold enough to yield, after working, a profit of nine million pounds. The curious fact is that the locality is not one which a geologist would have pointed out as likely to contain gold. The theory put forward to account for the presence of gold there is that it is a secondary formation. The gold is not in the original matrix. Nature has already mined it, chemically treated it, sublimated it, and redeposited it. The discovery is likely to give a stimulus to 'prospecting' in Queensland, and also in the other colonies.

— Professor Woldrich, at a recent meeting of the Vienna anthropological society, read a paper on the latest prehistoric remains found at Prerau. Several cartloads of bones had been found there while workmen were levelling for an orchard, and taken to the Olmütz museum. They were principally bones of mammoths, cave-bears, foxes, hares, etc.; but mingled with them were flint weapons, and some of the bones bore traces of being worked and cut. Charcoal was also found in the surrounding earth.

— The board of commissioners in charge of the lights on the coast of Scotland suggest that in cases of fog, when a light cannot reach its usual distance, the beam from a powerful source, such as electricity, might be depressed so as to concentrate the intensity on the near-hand sea by slightly moving the flame out of the focus of the apparatus, and supplementing it by the use of suitable reflectors. They also look upon the question of the relative absorption of electric light by fogs, compared with that of light from other sources, as yet undetermined, and requiring strict investigation.

— The brewers' journal, published in Nuremberg, the *Allgemeine brauer- und hopfenzeitung*, celebrates its twenty-fifth anniversary by offering prizes for two essays on, 1°, The culture of hops; 2°, Barley as brewing-material: the best essay to receive a prize of fifty pounds; the essay, in German, to be sent in to the editor before May 1, 1886.

— The effect of magnets upon artificially incubated hen's eggs formed the subject of some very interesting experiments, of which an account was given by Professor Carlo Naggiorani in a recent paper before the Academy dei lincei. During the hatching-process he kept one set of eggs under the influence of powerful magnets, while another set was incubated away from all such influence. Cases of arrested development were very numerous among the first set, and after birth the rate of death among these was four times as great as in the naturally incubated chickens. Only six chickens out of a hundred and fourteen eggs arrived at maturity. Of these, two were cocks of a splendid stature, and endowed with an insatiable reproductive appetite. With the four pullets the case was quite the reverse. One of these never laid at all, and the three others generally produced very minute eggs without yolks, without germinal spot, and, in a word, sterile.

— An experiment is being tried in the Jefferson physical laboratory, which promises to be successful. An ordinary seconds clock, with a wooden pendulum, is controlled by the signals from the Harvard college observatory, with no other mechanism than a fine spring connecting the pendulum to the armature of a telegraph instrument in the circuit. If the signals are interrupted during the day or night, the error of the clock, which seldom exceeds half a second in that time, will generally be rectified within an hour of their recurrence. The rate is in no way affected by the irregular signals caused in storms by the interference of the wires, and the regular impulses conveyed at intervals of two seconds increase but slightly the swing of the pendulum. The attachment can easily be made to any seconds clock at the cost of a few dollars, and may be of interest to those intolerant of the rates charged by companies for the use of electric dials.

— Aside from the munificent charities of the Salem East India marine society, extending over an unbroken period of eighty-six years, there is a scientific history covering a less extended period, which at this late day is by many persons forgotten, and to the younger generation is unknown. One visible result of this scientific work, although incidental to the more important objects for which the society was formed, is the rare ethnological collections now in the custody of the Peabody academy of science. When the museum was transferred to the trustees of the academy in 1867, such old catalogues and manuscripts accompanied the specimens as were supposed to relate to the collections. These were laid aside for a time, and forgotten. An examination of the various papers referred to, clearly shows that an earnest spirit of scientific research pervaded the early work of this society. The act of incorporation places charitable objects of the society first, and 'the promotion of a knowledge of navigation' second: the museum followed as incidental to the latter. Upon the foundation of the society, blank journals were immediately distributed, under the by-laws, to "every member bound to sea, . . . in which he shall enter the occurrences of his voyage, and particularly his observations of the variations of the compass, bearings and distances of capes and headlands, of the latitude and longitude of ports, islands, rocks and shoals, and of soundings, tide and currents, and on his return shall return the same for the use of the society." This latter clause was in reality meant for the benefit of the commercial interests of the country, which at that time largely centred in Salem. Many of the journals are beautiful examples of neatness and fine penmanship, and are embellished here and there with diagrams, maps, drawings of coasts, and even with sketches of native craft.

— The 'age of horn' is a term applied by Mr. G. Kaiser to the period of certain relics which he has found in his investigations of the Forel and Cortaillod stations on Lake Neuenburg in Switzerland, where he has been excavating under the auspices of the historical society of Neuenburg. The *Neue Zürcher zeitung* of Jan. 15 states that he found a stratum at a depth of from 1.20 m. to 1.30 m., which contained various horn objects, — such as amulets, cups, knives, daggers, mattocks, rings, buttons, bracelets, shield-studs, etc., — all of which were engraved either with dots or with straight lines; and he concludes that they are older than the bronze or stone implements found in similar localities. But some implement, presumably of stone or metal, must have been employed in cutting the horn; and certainly a single find hardly gives ground for such a wide generalization.

— Two important expeditions are now in progress by Russian travellers, — that of Prjevalski in northern Thibet, in part to discover the sources of the Yellow River; and that of Potanin to north-western China and south-eastern Mongolia. A large number of barometrical observations have been taken, which are to be worked up by Col. Scharnhorst.

— A full account by Lieut. Gordon, of the proceedings of the Hudson-Bay exploring expedition of 1884, with a track-chart of the steamer Neptune, and a report on the geology, etc., of the district visited, by Dr. Robert Bell, who accompanied the expedition in the interests of the Geological survey of Canada, have just been published in an appendix to the annual report of the Canadian department of marine.

— Among recent deaths we note the following: Professor Lauritz Esmark, director of the zoölogical museum of the university of Christiania, at Christiania, in December, 1884; Searles V. Wood, geologist and paleontologist, at London, Dec. 19; Dr. Philipp von Jolly, physicist, at Munich, Dec. 24, in his seventy-fifth year; Rev. James Buller of New Zealand; Alexander Murray, director of the geological survey of Newfoundland; Alfred Tylor, anthropologist and geologist, at London, Dec. 31; Dr. Friedrich von Stein, professor of zoölogy in the university of Prague, at Prague, Jan. 9, in his sixty-seventh year; Major-Gen. K. Sonklar von Instädten, at Innsbruck, Jan. 10; Dupuy de Lôme, engineer at Paris, Feb. 1, at the age of sixty-eight; E. H. von Baumhauer, secretary of the Société hollandaise des sciences; E. C. Rye, librarian of the London geographical society, Feb. 7, aged fifty-two; and S. G. Thomas, metallurgist at Paris, Feb. 1, aged thirty-four.

— At a united meeting of the Victoria and New South Wales geographical societies it was resolved that they should in future call themselves 'The Australian geographic conference,' for the purpose of discussing (periodically) important matters affecting the interest of geographic science of Australia. The governments of Victoria and New South Wales have each placed a thousand pounds at the disposal of the general society, and it is intended in the first place to undertake a thorough exploration of New Guinea.

— The emperor of Germany has conferred the 'Ordre pour le mérite' for science and arts on Sir Joseph Lister. Commenting on this recognition of an English surgeon whose name has furnished a new verb to the German language since the beneficent results obtained by his antiseptic method during the Franco-German war, the *Lancet* observes, "Not only is Sir Joseph Lister to be congratulated on this act of the venerable and most illustrious emperor, but the profession of the United Kingdom will recognize in the act a generous recognition of the claims of British medical science, which, it is only fair to say, is not new on the part of Germany. The discoverer of vaccination has been more honored in Germany than in his own country, in accordance with the scripture that 'cannot be broken.' The quiet evolution in surgery, involving the practical abolition of pyaemia, hospital erysipelas, and gangrene, and an infinite diminution in the calamities of surgery, which we owe to Sir Joseph Lister more than to any other single man, is a service to mankind not quite on the same scale as the discovery of vaccination, but of very far-reaching consequence. Through the slightly discordant notes of diplomacy it is refreshing to notice the harmony of international grace in the higher regions of science and of humanity."

— Some interesting experiments, according to the Journal of the Iron and steel institute, have recently been made for the purpose of determining the respective values of wet and dry coal for the evaporation of water. The results showed that small coal, containing eighteen per cent of water, and nine and nine-tenths per cent of coal-dust, evaporated five and seven-tenths pounds of water per pound of fuel; while the same amount of coal, containing three per cent of water, evaporated from eight to eight and a half pounds of water per pound of fuel. The figures showed that the employment of wet coal gave rise to a loss of from fifteen to twenty-five per cent.

— The programme for the Sheffield scientific school lectures to mechanics for 1885 is as follows: Feb. 12, Norway and the midnight sun, Rev. Dr. C. C. Tiffany; Feb. 17, Science and the supernatural, Professor DuBois; Feb. 19, The present commercial crisis, Mr. A. T. Hadley; Feb. 24, The Asiatic cholera, Professor Brewer; Feb. 26, The sensation of color, Professor Hastings; March 3, Cobwebs, Mr. J. H. Emerton; March 5, Lafayette, Prof. A. M. Wheeler; March 10, The patent law of the United States, Professor Robinson; March 12, Commemoration of the birthday of Bishop Berkeley, President Porter; March 17, The surface life of the Gulf Stream, Professor Verrill; March 19, Map projection, Professor Phillips; March 24, An hour at the Louvre, Prof. D. Cady Eaton. This course has now been in existence twenty years. A fee of one dollar is charged, that the audiences may be the better controlled.

— Sir John Lawes suggests (*Health*) that it will be more profitable to throw sewage into the sea than to apply it to the land. His grounds for saying this are that it will supply the enormous quantities of phosphate of lime, potash, and nitrogen which are necessary to the existence of fishes, but which exist in the sea only in small quantities. Tons of these compounds are taken from the ocean each year in our fisheries without due return. If, then, enough or more than enough to make up for that annually taken out could be returned to the sea in the form of sewage, there is little doubt that increased prosperity may accrue to the fisheries. Even after defecation, much of the nitrogen and mineral constituents would remain; and, indeed, this defecation, or else greater dilution, is absolutely necessary, in order to prevent the destructive work which sewage naturally does in absorbing the oxygen which is necessary to the existence of fishes.

— From the Journal of the Iron and steel institute we learn that Mr. Fayol concludes, from his experiments reported in the *Comptes rendus* of the Société de l'industrie minérale, that the rise of temperature accompanying the absorption of atmospheric oxygen by finely powdered coal is the chief cause of its spontaneous combustion. He finds that only a low temperature is needed to ignite powdered coal; lignite igniting at 150° C., and anthracite at 300° C., and the ordinary varieties of coal at intermediate temperatures. The avidity with which the oxygen is absorbed increases with the rise of temperature, which finally becomes sufficiently high for ignition. An important part in spontaneous combustion has been ascribed by many authorities to finely divided pyrites. The author, however, on subjecting this mineral to the same experimental conditions as the coal specimens, found a less energetic action of the atmosphere. When gradually heated up to 200° C., pyrites and coal behaved exactly alike till a temperature of 135° C. was reached: from this point the temperature of the pyrites remained the same, while the coal-powder rapidly became hotter till the igniting-point was reached.

— Dr. Harrison Allen has republished in a neat pamphlet (Philadelphia, *Blakiston*) his essay on the palategraph, a new and ingenious instrument of his own design, by which the motions of the soft palate may be recorded. The instrument is a straight rod eight inches long, which is passed into the nose so that one end rests upon the upper surface of the palate; just in front of the nose a wire loop encloses the rod, the wire being suspended from a band passed around the head; the loop acts as a fulcrum, so that, when the palate is raised, the free end of the rod moves down, and these movements are recorded upon a paper moved by clockwork (*kymographion*). The

fact that the soft palate is raised during articulation, swallowing, and coughing, can thus be readily demonstrated, and the length of its periods of ascent and descent measured. The palate is seen to be raised once only for some words, twice for others, three times for others. The numbers of these motions are invariable within a narrow range of individual variation. The instrument offers a ready means of detecting paralysis of the soft palate; and it has been suggested that it may be made available for the comparative study of phonetics, for the instruction of the deaf, and for the formation of a system of logography. One curious result we select to mention from the many details of the paper: less motion of the palate occurs in saying 'mamma' than 'papa.' Dr. Allen suggests that the smaller effort required may be one cause of children usually learning the former word first. Like all Dr. Allen's work, this also is excellent.

— In the series of manuals of technology edited by Professor Ayrton and Dr. Wormell, and published by Messrs. Cassell & Co., will soon be published a work on watch and clock making, prepared by Mr. David Glasgow, the vice-president of the British horological institute.

— We understand that *Papilio*, which was removed a year ago from New York to Philadelphia with a change of editor, is now practically to return to New York, as it is to be merged into the Bulletin of the Brooklyn entomological club. Both these names will be dropped at the close of the seventh volume of the Bulletin, in April next, and a new series commenced under the title of 'Entomologica *sic* Americana,' a monthly journal of twenty pages.

— The Journal of the Iron and steel institute sums up the known distribution of iron ore in north-west Africa as follows: "In Morocco there are beds of hematite of considerable size, and their continuity and re-appearance westwards is now an ascertained fact. Commencing from the Tunisian frontier, the Mediterranean seaboard offers an abundance of payable ore at various points, and these deposits were very extensively worked by the Romans, forming indeed their main supply. The most productive Algerian mines furnish a spathic carbonate containing sixty per cent of ferrous oxide, and a hematite containing ninety-two per cent of ferric oxide. The composition of the Algerian ore is exceedingly uniform, and it is almost entirely free from sulphur and phosphorus. These beds re-appear as far west as the confines of the provinces of Rihamina and Dukkala in South Morocco. The deposits consist of red hematite, and show an outcrop of very extensive area. Specimens brought from the Sahara caravan route either to Tafilelt or Timbuctoo prove the re-appearance of these iron-ore beds south of the Atlas ranges."

— The Brookville (Ind.) society of natural history proposes soon to issue a bulletin containing articles, by members of the society, on the natural history of south-eastern Indiana. Mr. W. H. Fogel of West Columbia, W. Va., has presented the society a large collection of archeological specimens, including one of the finest series of hematite implements in the United States. The society is continuing this winter the courses of free lectures, devoted to scientific subjects of popular interest, which it has formerly supported. The second of these lectures, on the ancient vegetation of the globe, was given by Joseph F. James of Cincinnati, on Jan. 13; and the third, on poisons, by Mr. J. U. Lloyd of Cincinnati, on Feb. 3.

— Mr. J. J. Thomson is to succeed Lord Rayleigh as professor of physics at the university of Cambridge.

— Mr. D'Arcy W. Thompson, formerly of Trinity college, Cambridge, has been elected professor of biology in University college of Dundee.

— With the number for 1885, the management of the *Neues jahrbuch für mineralogie, geologie, und palaeontologie* passes into the hands of M. Bauer of Marburg, W. Dames of Berlin, and Th. Liebisch of Königsberg.

— The modern mathematician finds the space of three dimensions, in which our visible universe is contained, entirely too contracted for his conceptions, and is obliged to imagine a space of n dimensions in order that his fancy may find room to disport itself. But it is a new idea, on the part of the novelist, to make the conceptions of transcendental geometry the basis for an amusing story. 'Flatland, a romance of many dimensions, by A. Square' (Boston, *Roberts brothers*, 1885), is in substance a description of life as a geometer might imagine it to be in space of one, two, or n dimensions. Readers of 'Alice behind the looking-glass' will not fail to notice the resemblance of the present work to that singular play of fancy. Curiously enough, a 'scientific romance' on the fourth dimension is just now announced in England by C. H. Hinton.

— A new application of the electric light, devised and used by W. E. Waters of Orange, N.J., is an improvement on the old style of illumination in the astronomical observatory. It consists of a small incandescent lamp-bulb, about three-quarters of an inch in diameter, placed in the end of a cylindrical hard-rubber handle, four inches long, with a push-button on the side. A flexible wire cord connects the apparatus with the battery-wires, and enables the operator to carry this 'electric lantern' about in the hand, ready for use at any moment. This lamp has been used by Mr. Waters about two years, and has proved entirely satisfactory.

— It is announced that Mr. William Cameron, who has given much time to the exploration of Malayan countries, has just prepared at Singapore, on a scale of half an inch to the mile, a large and elaborate map of districts recently explored by him in Selangor, Ulu Selangor, Sungei Ujong, and other parts of the Malay peninsula.

— Dr. R. Neuhauss, a young German physician, has returned to Berlin after extensive explorations among the South-Sea Islands, and has read a report of his researches before the Berlin anthropological society. Part of his ethnological collection he has presented to the Berlin museum.